

APPENDIX J

HPVA RESULTS FOR SALMON AND STEELHEAD PRODUCTION IN WASHINGTON LOWER COLUMBIA BASINS

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Tables J.1 through J.5 present the results of habitat population viability analyses (HPVA) completed to date of Lower Columbia basins in Washington State for chinook salmon, steelhead, and chum salmon production. Results are presented for three levels of habitat attributes: current conditions, PFC+ conditions, and historical conditions. The PFC+ level assumes properly functioning conditions in freshwater, as per the Matrix of Pathways and Indicators (NMFS 1996), and historical estuarine and nearshore conditions. Productivities, capacities, and equilibrium (no harvest) numbers of spawners (N_{eq}) are presented for each of these levels of habitat condition, assuming a Beverton-Holt production function. The diversity index is the percentage of theoretical life-history trajectories possible that are viable under the specified habitat conditions.

Literature Cited

National Marine Fisheries Service (NMFS). 1996. Making Endangered Species Act determinations of effect for individual or grouped actions at the watershed scale.

Willamette/Lower Columbia Salmonid Viability Criteria

Table J.1 HPVA results for fall chinook salmon production in Washington Lower Columbia basins.

Basin	Habitat Condition	Productivity	Capacity	N_{eq}	Diversity Index
Grays	Current	2.4	854	491	92%
	PFC+	10.2	2,485	2,241	100%
	Historical	12.6	2,690	2,477	100%
Lower Cowlitz	Current	5.9	9,626	7,992	65%
	PFC+	14.6	39,931	37,191	100%
	Historical	16.2	57,506	53,956	100%
Coweeman	Current	3.6	2,355	1,695	100%
	PFC+	12.1	4,885	4,482	100%
	Historical	16.0	5,304	4,971	100%
Toutle	Current	2.1	6,974	3,715	56%
	PFC+	11.1	23,840	21,683	100%
	Historical	14.5	27,275	25,392	100%
Kalama	Current	2.3	1,007	560	73%
	PFC+	5.9	1,519	1,262	100%
	Historical	9.8	2,733	2,455	100%
East Fork Lewis	Current	4.0	1,842	1,375	100%
	PFC+	10.9	3,980	3,614	100%
	Historical	13.7	4,554	4,220	100%
North Fork Lewis	Current	11.5	14,764	13,483	100%
	PFC+	19.2	36,226	34,339	100%
	Historical	22.7	45,369	43,371	100%
Washougal	Current	4.7	2,592	2,041	100%
	PFC+	12.4	6,260	5,756	100%
	Historical	16.9	7,990	7,518	100%
Wind	Current	4.1	647	490	65%
	PFC+	9.5	2,642	2,363	97%

Appendix J: HPVA Results in Washington Lower Columbia Basins

Table J.2 HPVA results for spring chinook salmon production in Washington Lower Columbia basins.

Basin	Habitat Condition	Productivity	Capacity	N_{eq}	Diversity Index
Toutle	Current	1.2	465	68	2%
	PFC+	15.3	2,280	2,131	100%
	Historical	25.1	3,022	2,901	100%
Kalama	Current	3.6	1,186	852	86%
	PFC+	12.5	2,409	2,217	100%
	Historical	26.9	4,340	4,178	100%
Wind	Current	3.6	1,747	1,256	89%
	PFC+	7.8	2,567	2,238	100%
	Historical	17.7	4,215	3,977	100%

Table J.3 HPVA results for summer steelhead production in Washington Lower Columbia basins.

Basin	Habitat Condition	Productivity	Capacity	N_{eq}	Diversity Index
Kalama	Current	3.9	1,237	923	88%
	PFC+	9.5	1,606	1,437	97%
	Historical	16.8	3,365	3,165	100%
East Fork Lewis	Current	1.8	200	91	17%
	PFC+	4.4	395	306	85%
	Historical	7.2	491	422	98%
Washougal	Current	3.0	568	376	67%
	PFC+	8.9	1,227	1,089	91%
	Historical	15.4	1,517	1,419	100%
Wind	Current	5.9	1,357	1,125	71%
	PFC+	8.7	1,588	1,404	86%
	Historical	14.0	2,463	2,288	100%

Table J.4 HPVA results for winter steelhead production in Washington Lower Columbia basins.

Basin	Habitat Condition	Productivity	Capacity	N_{eq}	Diversity Index
Lower Cowlitz	Current	5.0	397	318	30%
	PFC+	18.6	1,639	1,551	99%
	Historical	28.4	1,733	1,672	94%
Coweeman	Current	3.6	1,094	786	50%
	PFC+	12.6	1,894	1,743	92%
	Historical	18.4	2,372	2,243	100%
Toutle (total)	Current	2.8	2,145	1,382	37%
	PFC+	15.8	8,003	7,497	96%
	Historical	23.7	9,116	8,731	98%
South Fork Toutle	Current	3.4	785	551	52%
	PFC+	15.6	2,344	2,194	91%
	Historical	21.9	2,752	2,627	99%
Main stem/North Fork Toutle	Current	1.5	274	96	7%
	PFC+	15.0	2,119	1,978	100%
	Historical	24.9	2,370	2,275	100%
Green	Current	2.3	525	291	33%
	PFC+	10.2	1,344	1,212	96%
	Historical	17.1	1,588	1,495	100%
Kalama	Current	5.2	1,314	1,060	92%
	PFC+	16.1	1,793	1,681	99%
	Historical	22.6	579	554	100%
East Fork Lewis	Current	5.3	1,337	1,087	61%
	PFC+	17.3	2,633	2,480	98%
	Historical	26.6	3,253	3,131	100%
North Fork Lewis	Current	5.0	416	333	96%
	PFC+	19.8	649	616	100%
	Historical	30.2	737	713	100%
Washougal	Current	3.9	697	519	52%
	PFC+	18.2	2,111	1,995	100%
	Historical	28.7	2,588	2,497	100%
Duncan	Current	5.3	69	56	74%
	PFC+	10.1	132	119	93%
	Historical	27.6	242	233	93%
Hardy	Current	4.4	13	10	55%
	PFC+	6.1	19	16	59%
	Historical	11.3	31	28	99%
Hamilton	Current	5.7	265	219	39%
	PFC+	14.0	312	290	100%
	Historical	32.6	549	532	100%
Wind	Current	5.1	112	90	80%
	PFC+	12.4	192	177	100%
	Historical	20.2	256	243	100%

Appendix J: HPVA Results in Washington Lower Columbia Basins

Table J.5 HPVA results for chum salmon production in Washington Lower Columbia basins.

Basin	Habitat Condition	Productivity	Capacity	N_{eq}	Diversity Index
Grays	Current	3.5	1,512	1,080	2%
	PFC+	6.4	7,859	6,639	67%
	Historical	9.2	8,431	7,511	72%
Lower Cowlitz	Current	1.5	5,861	1,819	6%
	PFC+	4.5	110,837	86,424	100%
	Historical	5.9	158,702	131,803	100%
Coweeman	Current	0.0	334	0	0%
	PFC+	4.2	7,771	5,921	54%
	Historical	4.5	10,406	8,072	58%
Toutle	Current	0.0	564	0	0%
	PFC+	4.8	15,937	12,630	56%
	Historical	7.8	22,613	19,707	61%
Kalama	Current	1.1	1,462	157	2%
	PFC+	4.7	7,879	6,210	43%
	Historical	6.6	11,743	9,953	50%
East Fork Lewis	Current	0.0	4,215	0	0%
	PFC+	5.1	30,269	24,334	30%
	Historical	7.6	41,924	36,415	40%
North Fork Lewis	Current	1.7	5,375	2,157	20%
	PFC+	4.2	41,051	31,183	67%
	Historical	6.6	62,851	53,256	72%
Washougal	Current	1.0	568	17	0%
	PFC+	6.2	9,939	8,336	100%
	Historical	8.6	17,129	15,140	100%
Duncan	Current	3.7	111	81	100%
	PFC+	9.5	241	215	100%
	Historical	10.3	47	43	100%
Hardy	Current	3.0	94	63	36%
	PFC+	10.4	245	221	36%
	Historical	10.7	277	251	42%
Hamilton	Current	2.9	852	557	78%
	PFC+	10.0	3,031	2,729	88%
	Historical	10.7	3,140	2,847	89%
Wind	Current	1.6	952	349	13%
	PFC+	5.2	6,432	5,203	57%
	Historical	6.0	10,713	8,912	64%